Enumeration of Adult Chum Salmon, *Oncorhynchus keta,* in the Fishing Branch River, Yukon Territory, 1996

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2002

Canadian Manuscript Report of Fisheries and Aquatic Sciences 2594

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Canadian Manuscript Report of

Fisheries and Aquatic Sciences 2594

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ENUMERATION OF ADULT CHUM SALMON, *Oncorhynchus keta*, IN THE FISHING BRANCH RIVER, YUKON TERRITORY, 1996

by

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Cat. No. Fs 97-4/2594E ISSN 0706-6473

Correct citation for this publication:

Boyce, I. 2002. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1996. Can. Manuscr. Rep. Fish. Aquat. Sci. 2594: 33 p.

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A total of 77,200 migrating adult chum salmon (*Oncorhynchus keta*) were enumerated at a weir on the Fishing Branch River from August 19 through October 22, 1996. The run was estimated to be 52.2% female (n=77,200), 0.3% age-3_1, 67.8% age-4_1, 29.3% age-5_1, 2.5% age-6_1 and 0.1% age 7_1 (n=690). Fork length (mm) averaged 694 for males (n=854) and 648 for females (n=836). Sixty-three spaghetti tags were observed. Six tagged fish were captured. These fish had been marked at Rampart Rapids; average time in transit and migration rates were 27.8 days (std. dev.=6.7) and 53.3 km/day (std. dev.=16.4), respectively. In a sample of fish that drifted downstream onto the weir the estimated expenditure of milt/eggs averaged 80.1% for males (n=74, std. dev.=19.4%) and 84.3% for females (n=76, std. dev.=19.4%). Four chinook and 12 coho salmon were observed. Water temperature ranged from 7.5°C to 0.5°C; level fluctuated by 9 cm.

RÉSUMÉ

Boyce, I. 2002. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1996. Can. Manuscr. Rep. Fish. Aquat. Sci. 2594: 33 p.

Entre le 19 août et le 22 octobre 1996, on a dénombré un total de 77 200 adultes de saumon kéta (*Oncorhynchus keta*) en migration à une pêcherie fixe installée sur la rivière Fishing Branch. On a estimé que la remonte se composait à 52,2 % de femelles (n=77 200), dont 0,3 % d'âge 3_1, 67,8 % d'âge 4_1, 29,3 % d'âge 5_1, 2,5 % d'âge 6_1 et 0,1 % d'âge 7_1 (n=690). La longueur à la fourche (mm) était en moyenne de 694 pour les mâles (n=854) et de 648 pour les femelles (n=836). On a observé 63 étiquettes spaghetti. Six poissons marqués ont été capturés; ils avaient été marqués aux rapides Rampart; le temps moyen de transit et la vitesse de migration étaient respectivement de 27,8 jours (écart-type=6,7) et de 53,3 km/jour (écart-type=16,4). Dans un échantillon de poissons récupérés à la pêcherie alors qu'ils dérivaient vers l'aval, on a estimé l'émission moyenne d'œufs et de laitance à 80,1 % pour les mâles (n=74, écart-type=19,4 %) et à 84,3 % pour les femelles (n=76, écart-type =19,4 %). Quatre quinnats et douze cohos ont été observés. La température de l'eau allait de 7,5 °C à 0,5 °C; le niveau de l'eau a fluctué de 9 cm.

1.0 INTRODUCTION

Chum salmon (*Oncorhynchus keta*) native to the south fork of the Fishing Branch River have been enumerated annually since 1971. From 1972 to 1975, 1985 to 1989, and 1991 to 1996 a weir was used; in other years, escapement was estimated using aerial counts (JTC 1996b). Field operations and administration for the enumeration program have been conducted by Fisheries and Oceans Canada (DFO) in co-operation with the Vuntut Gwitchin First Nation (VGFN).

The 1996 Fishing Branch River weir project supported the Upper Yukon River fall chum salmon mark-recapture project, a co-operative study involving the U.S. National Marine Fisheries Service (U.S. NMFS), the U.S. Fish and Wildlife Service (U.S. FWS), the Alaska Department of Fish and Game (ADF&G) and DFO. The objectives of the project were to estimate the number of chum salmon migrating past Rampart, Alaska and to study the distribution of fall chum salmon stocks throughout the upper Yukon River drainage basin. In 1996, approximately 18,000 spaghetti tags were applied at Rampart Rapids, approximately 50 km downstream of the village of Rampart. Two fishwheels were used to capture the fish for tagging – one adjacent to each bank of the river. Different coloured tags were used to identify capture fishwheel (Gordon et al 1998).

1.1 OBJECTIVES

The specific objectives of the 1996 Fishing Branch chum enumeration program were as follows:

1. to enumerate, by species and sex, all adult salmon passing the weir site;
2. to assess age/ length composition and spawning success of the adult chum salmon passing the weir site;
3. to document hydrological conditions (temperature and level); and
4. to collect data related to the spaghetti-tagging project at Rampart; specifically, the number of tags observed.

1.2 WATERSHED DESCRIPTION

Located in the northern Yukon Territory, the south fork of the Fishing Branch River is a headwater tributary of the Porcupine River, itself a major tributary to the Yukon River. The Fishing Branch River flows northeast out of the Ogilvie Mountains, draining an area of

approximately 1700 square kilometres (NTS 116 J.K E 1/2, Department of Mines and Technical Surveys 1959). The south fork joins the north fork near Bear Cave Mountain and flows into the Miner River, a tributary of the upper Porcupine River (Figure 1). The spawning area on the Fishing Branch River is approximately 2,600 km from the Bering Sea (Bergstrom 1991).

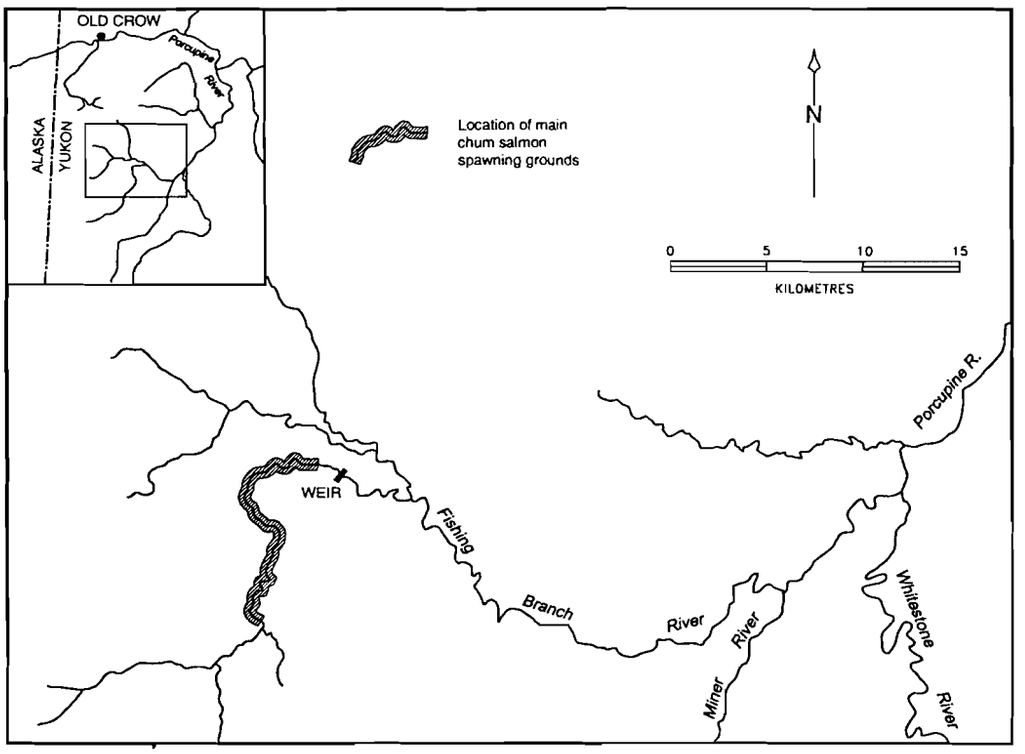

Figure 1. Map of the weir site on the fishing branch river.

The terrain in the Fishing Branch River watershed includes rolling hills with elevations generally below 450 m with some mountains up to 1000 m. Muskeg often extends to the riverbank. Trees include black and white spruce, willow and birch. There are ponds and thermokarst basins in the region, but no lakes (Oswald and Senyk 1977).

The closest climatological station to the Fishing Branch River is in Old Crow, approximately 120 km to the north of the weir site. Temperatures recorded at the station during the period 1968-1990 averaged -9.3 °C and ranged from -59°C to 32 °C. The mean annual precipitation during this period was 239.5 mm. (Environment Canada files).

The main channel of the Fishing Branch River is clear, swift, and meandering with riffles, large exposed gravel bars and pools up to 2.5 m deep. The streambed is made up of large cobble (50-250 mm) and medium cobble (2-50 mm) (Bryan 1973). Side channels are slow and have fine granular sediment over medium cobble (Bruce 1975).

Stream discharge fluctuates greatly due to regional precipitation and the spring snowmelt. Flood-like conditions in the summer and fall after rainfall are not uncommon. Available flow measurements at the weir site range from 11.3 cubic metres per second in March 1972 (Steigenberger 1972) to 56.6 cubic metres per second in September 1972 (Elson 1975). A 15 km stretch of groundwater discharge in the headwaters of the south fork of the Fishing Branch River maintains open water in winter many kilometres downstream. The weir site is in the open water area.

1.3 FISHERIES RESOURCE OVERVIEW

1.3.1 Species Present

The south fork of the Fishing Branch River is a major spawning ground for fall chum salmon[1]. Estimates of escapement have ranged from 15,150 to 353,282 chum salmon (JTC 1996b and Elson 1976). Spawning occurs from September to November. The groundwater flow provides a habitat suitable for spawning adults, incubating eggs and rearing juveniles when temperatures in the region are well below freezing (Steigenberger 1972).

Coho salmon (*O. kisutch*) spawn in the same area in October and November. Bryan (1973) reported that 150 coho juveniles were seined in a 300 square metre shallow riffle area of the Fishing Branch River in March 1972 and 12 were caught in a seine in May 1972. Low numbers of adult coho salmon have been enumerated at the weir. However, total escapements are unknown since the weir is removed before the coho migration is believed to be complete, because of weather conditions.

In July and August, chinook salmon (*O. tshawytscha*) also spawn in the groundwater area (Steigenberger, et al. 1973). Low numbers of adult chinook have been observed at the weir and it has been suggested that the majority of the escapement each year occurs prior to weir installation. However, this was not supported by observations made in 1998 (Doehle 1999, Boyce and Wilson 2001).

Non-salmon species present in the area include: slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), Arctic grayling (*Thymallus arcticus*), and burbot (*Lota*). Northern pike (*Esox lucius*), humpback whitefish (*Coregonus clupeaformis*) and broad whitefish (*Coregonus nasus*) have also been noted at the weir site, and in the lower limits of the Fishing Branch River (Steigenberger et al. 1973).

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[1] Chum salmon in the Yukon River system can be separated into two major groups: fall (or autumn), and summer. Fall chum can be distinguished from summer chum as adults by: (1) later entrance into freshwater, (2) less developed reproductive systems at the time of entry into freshwater, (3) a later spawning period, (4) larger size, and (5) greater fecundity (Groot and Margolis 1991).

1.3.2 Non-Human Utilisation

Grizzly bears, wolves and eagles, among other mammals and birds are known to be supported in part by the salmon stocks of the Fishing Branch River.

In a 6.5 km reach located in the vicinity of the weir site, the grayling population has been estimated to be 9,000 fish (Bruce 1973). In that study, stomach content analyses showed that the grayling diet included chum eggs and alevins. Other fish species native to the Fishing Branch River are believed to prey upon chum salmon eggs, alevins, and fry.

1.3.3 Human Utilisation

Fishing Branch River salmon are harvested in Canada by the VGFN on the Porcupine River near Old Crow, and in Alaskan subsistence and commercial fisheries along the length of the Yukon River in the United States. They may also be intercepted in the United States groundfish trawl fisheries in the Bering Sea-Aleutian Islands area and the Gulf of Alaska, in purse seine and salmon gillnet fisheries in the "False Pass" area near the south Alaska Peninsula, and in coastal gillnet fisheries in Norton Sound. Until 1992, Fishing Branch River salmon may have been harvested in other off-shore fisheries, namely:

1. the Japanese high-seas mothership and land-based salmon gillnet fisheries;
2. the high-seas squid gillnet fisheries in the North Pacific Ocean of Japan; the Republic of Korea, and the Republic of China (Taiwan);
3. the foreign groundfish fisheries of the Bering Sea and Gulf of Alaska;
4. the joint-venture groundfish fisheries of the Bering Sea and Gulf of Alaska; and
5. the groundfish trawl fishery by many nations in the "Doughnut Hole" international waters area of the Bering Sea.

These fisheries harvested large numbers of salmon some of which were likely of Yukon River origin, and therefore potentially of Fishing Branch River origin. However, several of the offshore fisheries have been phased out by international agreements (JTC 1993c).

2.0 METHODS

2.1 WEIR LOCATION AND CONSTRUCTION

The weir was installed on the south fork of the Fishing Branch River approximately 31 km west of the Miner River confluence (Figure 1). The location has not varied since a weir was first installed on the Fishing Branch River in 1972. Approximate co-ordinates are 66°32′ north and 139°15′ west (NTS map reference 116JK 1:50,000).

Materials and methods used to construct the weir were similar to those used since 1985. Photographs of the structure are presented in Boyce 2001. Components included approximately 15 iron tripods, plywood/angle-iron stringers, electrical conduit, Vexar™[2] (plastic screening) and sandbags. A sampling chamber constructed from rebar, angle-iron stringers, and conduit was placed where flow was the greatest (close to the middle of the river). This formed the apex of the weir. Tripods were placed out at a slight angle downstream from the sampling chamber to each bank of the river. The distance between tripods was 3m (10 ft.). Tripods were interconnected by pairs of horizontal stringers that were bolted approximately one quarter and three quarters of the way up from the bottom of the upstream leg of each tripod. Conduit inserted at 5 cm (2") centres through the stringers provided the actual barrier to fish migration. Conduit was also inserted into the sampling chamber frame at the upstream end and sides. There was no gate at the downstream end of the chamber. Fish passage through the weir was made possible by removal of two or three pieces of conduit from the upstream end of the chamber. (This opening is hereafter referred to as the "gate".) A platform, supported by the weir itself and rebar driven into the river bottom, was placed by the side of the sampling chamber to permit enumeration and sampling.

Vexar™mesh was laid out along the lower portions of the conduit to further stabilise and seal the weir. Approximately 120 burlap bags filled with gravel were used to hold the Vexar™ in place and help anchor the structure.

Lighting consisted of approximately fourteen floodlights (100 and 150 watt) strung across the weir and within the camp, to facilitate night counting and to provide safe conditions for personnel. A gasoline-fuelled generator was used as the power source.

Weir construction was completed on August 18 at 2300 hrs.

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[2] Mention of trade names does not constitute endorsement.

2.2 ENUMERATION

2.2.1 Weir

Enumeration commenced three hours after weir installation was complete.

Migrants were counted at the upstream end of the sampling chamber as they swam through the open gate, or were manually transported over the closed gate using a dip-net. Approximately 2% of the run was handled in order to estimate its age and length composition. When practicable, tagged fish were captured and stripped of their tags (Appendix 5).

Generally fish passage occurred 24 hours per day. Exceptions to this occurred shortly after weir installation when few fish were present, occasionally just prior to sampling in order to allow fish to congregate in the sampling chamber, and when staff were occupied with other duties such as sampling carcasses. This amounted to a total of 117 hours over the course of the season (Appendix 1).

Enumeration ceased at midnight on October 22. Demobilisation commenced the following morning.

2.2.2 Aerial survey

There was no aerial survey in 1996 (see Section 4.0).

2.3 BIOLOGICAL SAMPLING

The chum salmon escapement was sampled in order to estimate age and length composition by sex. Fish were retrieved from the sampling chamber with a dip-net and placed in an aluminium tub containing river water. Using forceps, three scales were removed from the preferred area (located above the lateral line on an imaginary line extending from the posterior end of the dorsal fin to the anterior end of the anal fin). Fork length was measured to the nearest five mm using a flexible plastic tape measure. Sex was recorded. After sampling, fish were placed in an in-river recovery pen on the upstream side of the weir, from which they could exit freely.

A total of 1,690 live fish were sampled for age-length data. The target sample was 750 fish; this target was based on the number of samples required to characterise a population of approximately 100,000 fish having three age classes, with 95% confidence and +/- 5% precision (DFO files; from Cochran 1977). It was assumed that approximately 30% of the scales would be uninterpretable due to resorption. Protocol dictated that sampling be conducted in proportion to run timing; the unexpected abundance meant that the earlier part of the run was over-sampled.

Age (scale) samples were sub-sampled in proportion to run timing; only 798 samples were processed.

Measurements and age structures were also collected from carcasses of chum salmon that had drifted downstream onto the weir, either deceased or in a moribund state. Sex, post-orbital hypural (POH) length, and fork length were recorded. Ten scales were removed from each fish. This exceeded the number removed from live samples since handling time was not a concern, and it was expected that scale resorption would be a greater problem. Pectoral fins, otoliths and vertebrae were also collected. The gonads in each carcass were examined in order to assess spawning success. The amount of reproductive material observed was expressed as a percentage of what was estimated to have been present prior to spawning. Pre-spawn fish were not examined for comparison purposes.

The primary purpose of the carcass sample was to augment the live fish sample. Bony structures assisted in the interpretation of scale patterns by providing insight on resorption rates. On sexually mature fish that have migrated large distances without feeding, bony structures provide more reliable age data than scales, since they do not appear to be subject to the same degree of resorption. The two length measurements were taken in order to allow inference of POH length on live fish. POH length is more difficult to measure than fork length on living fish; however it is often a more useful estimator of length since it is not influenced by the changes in morphology that chum salmon exhibit as they approach sexual maturity (primarily kype development). A total of 150 carcasses were sampled in 1996.

2.4 HYDROLOGICAL DATA

Water temperature and level was recorded every four hours, with some interruptions. Temperature (°C) was taken from the platform adjacent to the sampling chamber using a hand-held alcohol thermometer. The temperature within the top six inches of the water column was measured.

A staff gauge was positioned close to the south bank of the river approximately five metres downstream from the weir. Placement may have varied slightly from other years of the study. The function of the gauge, which was not zeroed or placed in the deepest section of the river, was to track water level fluctuation throughout the 1996 enumeration period.

2.5 AGE ANALYSIS AND DATA STORAGE

Scales, pectoral fins, otoliths, and vertebrae were sent to the Fish Ageing Lab at the DFO Pacific Biological Station in Nanaimo, B.C. for age analysis.

Raw data were transcribed into Microsoft® Excel and stored at the DFO office in Whitehorse, Y.T.

3.0 RESULTS

3.1 ENUMERATION

3.1.1 Weir Count

A total of 77,200 adult chum salmon were observed passing the weir site in 1996 (Appendix 2).

The run appeared to have four major peaks, increasing in magnitude over time (Figure 2). The highest daily count, 4,988 fish, was recorded on September 19. The run mid-point fell on September 16. A late pulse of fish was observed on October 18.

Hourly counts are presented in Appendix 3.0 and Appendix 3.1. (The count recorded for a given hour represents the number of migrants observed from the beginning to the end of that hour). Figure 3 depicts diel run timing averaged over the course of the observed run. (The numbers of fish that passed through the weir at a specific time each day were summed and divided by the number of days.) Certain days were censored, specifically those on which fish passage was completely halted for more than one hour[3] or there was a count of fewer than 500 fish. (Variability in diel run timing appeared to increase substantially on days with very low weir passage rates.) The average hourly counts suggest that 1800 hrs and 2000 hrs to midnight were the favoured times for fish passage. However, variability was high (Appendix 3.2).

The number of upstream migrants identified as female was 40,269 (n=77,200), comprising 52.2% of the total count. The contribution of females increased over time, ranging from 39.0% (n= 3,732) in statistical week (SW) 35, to 66.9% (n=281) in SW 43 (Table 1).

Four chinook salmon and 12 coho salmon were observed migrating through the weir in 1996 (Appendix 4). The chinook were observed between August 20 and September 23, inclusive. Sex composition was not determined. One post-spawn female chinook was recovered on the upstream side of the weir on October 19. The coho were observed from October 8 to October 21, inclusive. One was female; the gender of the others was not determined. Whitefish and arctic grayling were also observed at the weir site.

3.1.2 Tag Data

A total of 63 spaghetti tags were observed at the weir (Appendix 5). Forty of these were yellow; the rest were white. Six tags were recovered; these had been applied at Rampart Rapids, Alaska. On average, 27.8 days elapsed (n=4; std. dev.=6.7) between the tag application and tag

[3] i.e. when the gate was closed and no fish were manually transferred over the gate.

recovery events. This translates to an average migration rate of 53.3 km/day[4] (std. dev.=16.4) assuming that each fish resumed its migration immediately after tag application and was captured immediately upon arrival at the weir.

3.2 BIOLOGICAL SAMPLING

3.2.1 Live Fish

Sampling effort in relation to run timing is presented in Table 2.

Fork length measurements taken from live male and female chum salmon are presented in Table 3. Post-orbital hypural lengths are also presented; these are inferred from fork lengths using the formula developed by regression analysis of lengths obtained from carcasses. The fork lengths taken from males averaged 694 mm (std. dev.=37 mm; n=854). The fork lengths obtained from females averaged 648 mm, (std. dev.=31 mm; n=836). The POH lengths calculated for males averaged 543 mm (std. dev.=25 mm). For females, POH length averaged 528 mm (std. dev.=21 mm).

Of the 798 scale samples taken from live fish and sent to the morphology lab for processing, 690 (86.5%) yielded complete age data. Of the remaining samples, 61 (7.6% of total) were resorbed, 17 (2.1%) were regenerated and 30 (3.8%) had been mounted incorrectly on the scale cards. Age data for each week were expanded by the weir count, with each sex treated separately (Table 4). The estimated age composition for the run was as follows: 0.3% age-3_1, 67.8% age-4_1, 29.3% age-5_1, 2.5% age-6_1, and 0.1% age-7_1. Data by SW are presented in Appendix 6.

3.2.2 Carcasses

Age, sex and length data collected from the carcasses of fish that drifted downstream to the weir are presented in Appendix 7. Estimates of the expenditure of eggs or milt in individual carcass samples were somewhat variable, averaging 80.1% (std. dev.=19.4%; n=74) for males and 84.3% (std. dev.=19.4%; n=76) for females. Minimum values were 40% and 10% for males and females respectively.

Linear regression was used to determine the relationship between fork length and POH length. Males and females were treated separately. The relationship for each gender was significant at $p_{critical}=0.05$. The equation developed for males was $a = 0.68b + 69.8$ (df=69; r-square=0.83), where a = *fork length* and b = *POH length*. Likewise, the equation developed for females was $a = 0.68b + 86.8$ (df=72; r-square=0.79).

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[4] Rampart Rapids and the Fishing Branch River weir are approximately 1,176 and 2,575 kilometres, respectively, from the mouth of the Yukon River (Bergstrom et al 1991).

3.3 HYDROLOGICAL DATA

Water temperature readings are presented in Appendix 8. The range observed over the course of the season was 7.0°C. The maximum temperature recorded was 7.5°C (August 31); the minimum was 0.5°C (October 22). Readings taken at 2000 hrs each day are presented in Figure 4.

The highest water level reading, 0.65 m, was taken on August 19 at 2000 hrs (Appendix 9). Levels do not reflect the absolute depth of the river as the gauge was not zeroed or placed in the deepest section of the river. The lowest reading, 0.56 m, was taken after October 18. Fluctuation was slight after the first few days of measurement. Figure 5 depicts the water level readings at 2000 hrs each day.

4.0 DISCUSSION

The Fishing Branch River weir count was 83% higher than the 1992–1995[5] average of approximately 42,000 chum salmon (Appendix 10). It was well below the lower end of the interim escapement objective range of 50,000 to 120,000 chum salmon, which was established through the Canada/U.S Yukon River Salmon Negotiations.

Figures 6 and 7 illustrate 1996 counts relative to those averaged over the recent cycle (1992-1995). The mid-point of the migration past the weir, September 16, was slightly earlier than the average mid-point, September 21. In contrast, the date on which the peak count was observed, September 19, was four days later than average. This average was strongly influenced by an unusually early peak in 1992 (September 6).

The contribution of females to the run (52%) approximated the recent cycle average (54%). The slight predominance of females that is observed at the weir most years might be a factor of gear selectivity in downstream fisheries. Males may be more susceptible to capture in gillnets because of their more pronounced snouts and teeth, particularly as they approach maturity (Milligan et al, 1986). Since most fish were not handled to determine gender, there was potential for error due to observer bias, poor visibility of individual fish because of high densities, low water clarity, and low light levels. Comparisons were made with the sex composition in the group of fish sampled for age and length data. All fish in this sample were closely inspected for gender. The pooled sample (n=1,690) was 53% female, almost identical to the estimated run sex composition.

The fact that on average the carcasses sampled contained only small amounts of reproductive material (eggs/ milt) suggests that most of the population spawned successfully.

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[5] This period was chosen because it represents the most recent cycle; the predominant age of spawning Fishing Branch River chum salmon is four years.

No aerial enumeration was conducted in 1996, since the relationship between aerial (helicopter) survey counts and weir counts has been quite variable. It appears that an aerial count is a poor substitute for a weir count. Prior to 1990, for years when there was no weir installed, aerial survey results were expanded by a factor of 2.71 to estimate escapement. In 1990, an expansion factor of 3.57 was used (JTC 1993c). Variability in aerial survey results can be due to differences in observer efficiency, water depth, clarity, and spawner density, run timing, and environmental factors. The density of spawners, their colouration, and the low light levels often experienced in September/ October make aerial enumeration of Fishing Branch River chum salmon particularly challenging.

It was expected pre-season that an average number of Fishing Branch River chum salmon would return from the ocean to the mouth of the Yukon River in 1996. The expectation was based on an assumed productivity of 2.5 returns per spawner (r/s) for the principle brood years (1991 and 1992, respectively), and an expected return age composition of 71% age-four and 27% age-five. The 1996 forecast was for a return (i.e. run size) of 67,000 fish. In comparison, the run size was estimated to have averaged approximately 60,000 chum salmon from 1992-1995[6] (JTC 1996a).

The harvest of 3,025 chum salmon by the VGFN in the vicinity of Old Crow was close to the 1992–1995 average of approximately 2,900 fish. The U.S. harvest of Fishing Branch River chum salmon, estimated using the footnoted assumptions, was 25,420 fish (DFO files). The number of Fishing Branch River chum (U.S. and Canadian harvest, plus escapement) that returned to the mouth of the Yukon River in 1996 is therefore estimated to have been 105,645 fish, significantly greater than the pre-season projection. The harvest rate is estimated at 27%.

5.0 RECOMMENDATIONS

The weir should continue to be operated annually as it serves as the only index of chum salmon escapement in the Canadian portion of the Porcupine sub-basin of the Yukon River in Canada. The Fishing Branch River chum salmon stock is of substantial socio-economic value to the Vuntut Gwitchin First Nation. The international importance of the Fishing Branch River chum stock has also been recognised, and stock rebuilding options have been discussed (JTC 1993b).

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[6] The stock size is used here to mean the number of adult fish returning to the Yukon River from marine areas. Run size calculations are based on the following assumptions: (a) 30% of the U.S. catch is composed of Canadian-origin fish; (b) the U.S. harvests Canadian stocks in the same ratio as: upper Yukon River border escapement-to-Porcupine River border escapement; and (c) the Porcupine River border escapement consists of the Old Crow catch plus the Fishing Branch River escapement. A key assumption is that the Fishing Branch River upstream of the weir site is the only chum spawning area in the Canadian portion of the Porcupine River drainage.

6.0 ACKNOWLEDGEMENTS

Marty Strachan, Derek Able-Chitze and Isaac Thomas of the VGFN conducted the project fieldwork. Pam Vust and Lesia Hnatiw assisted with data processing. Sandy Johnston provided comments on a draft of this report. Sean Stark assisted with proofreading. Personnel in the Fish Ageing Lab at the Pacific Biological Station in Nanaimo, including Shayne MacLellan and Darlene Gillespie, provided fish ages.

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Table 1. Weekly counts by sex of chum salmon at the Fishing Branch River weir, 1996.

Stat Week	Week Ending	Male	Female	Total	% Female
34	24-Aug	451	297	748	39.7%
35	31-Aug	2,276	1,456	3,732	39.0%
36	7-Sep	5,561	4,310	9,871	43.7%
37	14-Sep	10,022	8,137	18,159	44.8%
38	21-Sep	10,773	13,151	23,924	55.0%
39	28-Sep	4,112	6,628	10,740	61.7%
40	5-Oct	2,413	3,984	6,397	62.3%
41	12-Oct	717	1,265	1,982	63.8%
42	19-Oct	513	853	1,366	62.4%
43	26-Oct	93	188	281	66.9%
Total		36,931	40,269	77,200	52.2%

Table 2. Sample effort in relation to run timing at the Fishing Branch River weir, 1996.

Stat Week	Week Ending	Count	% Count	Sample	% Sample
34	24-Aug	748	1.0%	20	1.2%
35	31-Aug	3,732	4.8%	196	11.6%
36	7-Sep	9,871	12.8%	470	27.8%
37	14-Sep	18,159	23.5%	314	18.6%
38	21-Sep	23,924	31.0%	410	24.3%
39	28-Sep	10,740	13.9%	130	7.7%
40	5-Oct	6,397	8.3%	70	4.1%
41	12-Oct	1,982	2.6%	60	3.6%
42	19-Oct	1,366	1.8%	20	1.2%
43	26-Oct	281	0.4%	0	0.0%
Total		77,200	100.0%	1,690	100.0%

Table 3. Length composition by sex and age of Fishing Branch River chum salmon, 1996.

Age	31	41		51		61		71	Combined	
Sex	Female	Female	Male	Female	Male	Female	Male	Male	Female	Male
N	2	248	217	100	104	9	9	1	836	854
Fork Length										
Ave	610	638	682	659	702	667	715	735	648	694
Max	620	735	785	715	795	725	770	735	750	795
Min	600	550	605	595	607	610	675	735	550	595
Var	200	826	1199	693	1166	1244	1031		939	1370
Stdev	14	29	35	26	34	35	32		31	37
Hypural Length										
Ave	502	521	534	535	548	541	557	570	528	543
Max	509	587	604	574	611	580	594	570	597	611
Min	495	461	482	492	483	502	529	570	461	475
Var	93	383	556	321	541	576	478		435	635
Stdev	10	20	24	18	23	24	22		21	25

Table 4. Age composition of Fishing Branch River chum salmon, 1996.

		Age Class					
	N	31	41	51	61	71	Total
Male	331	0.0%	67.2%	30.0%	2.5%	0.3%	100%
Female	359	0.5%	68.5%	28.1%	2.9%	0.0%	100%
Combined	690	0.3%	67.8%	29.3%	2.5%	0.1%	100%

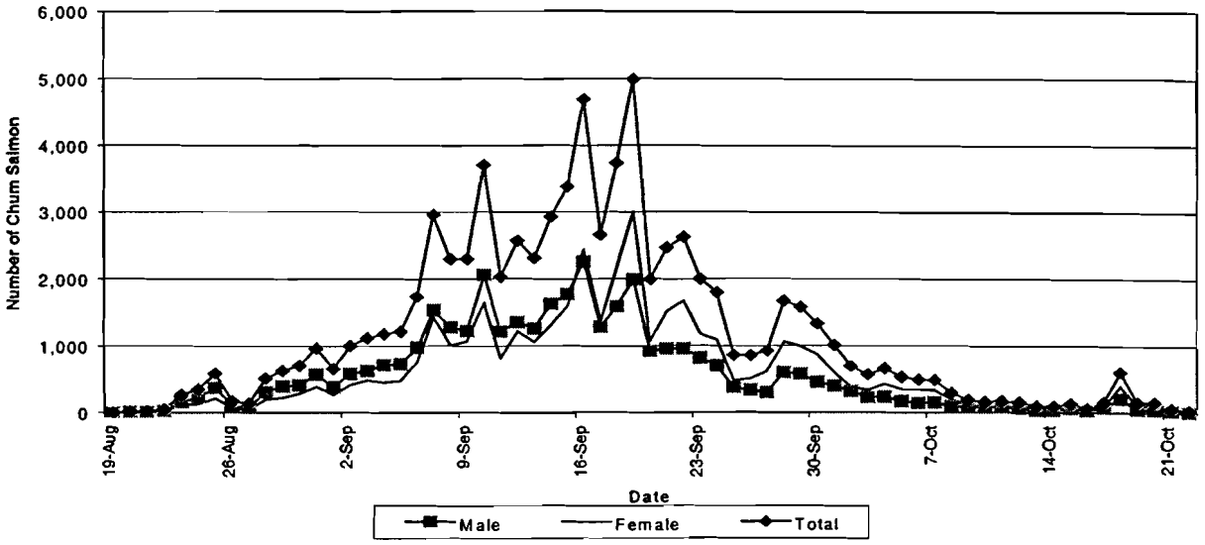

Figure 2. Daily counts of chum salmon through the Fishing Branch River weir, 1996.

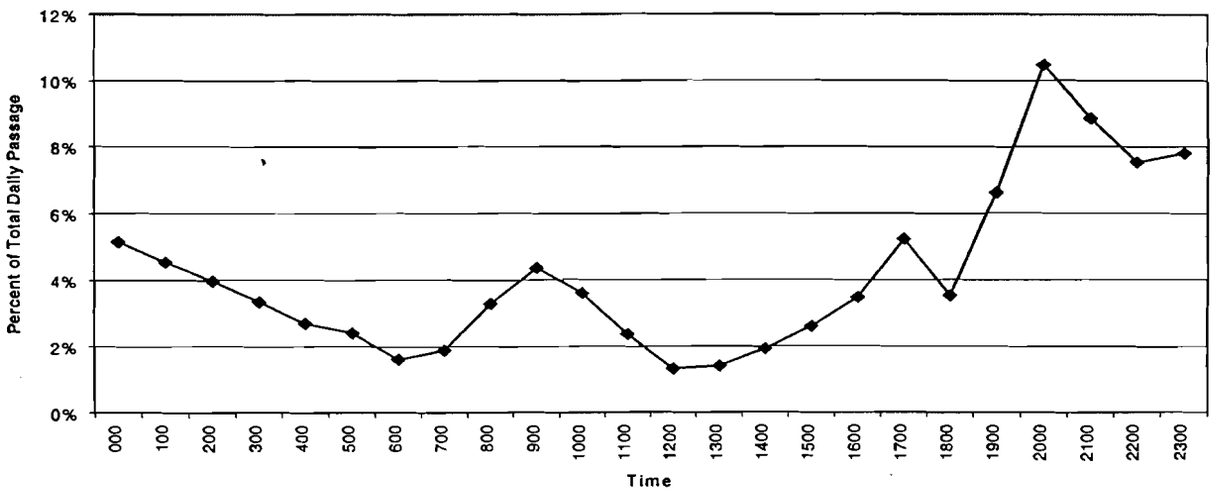

Figure 3. Average diel run timing of chum salmon through the Fishing Branch River weir, 1996.

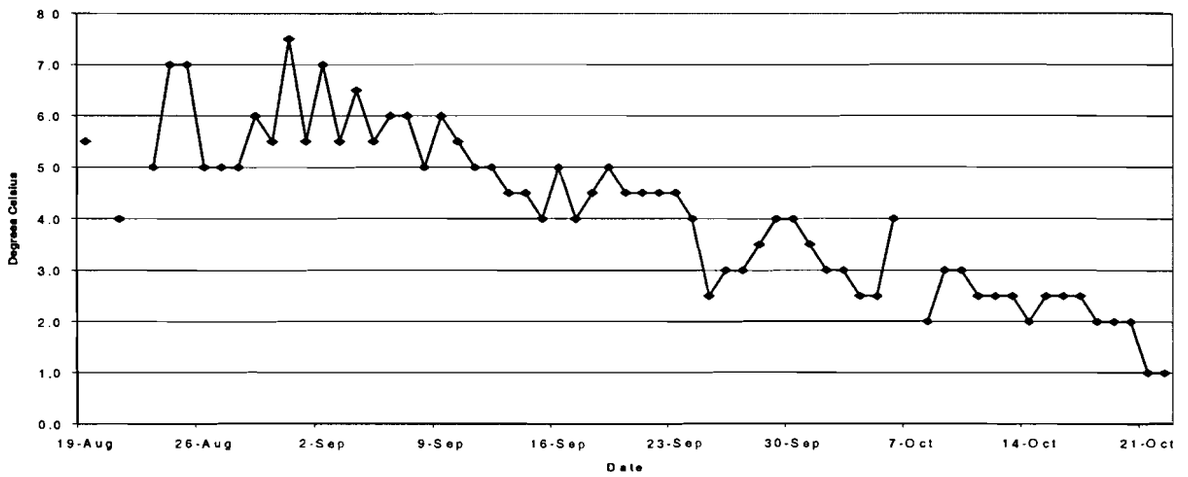

Figure 4. Daily water temperatures recorded at Fishing Branch River weir, 1996.

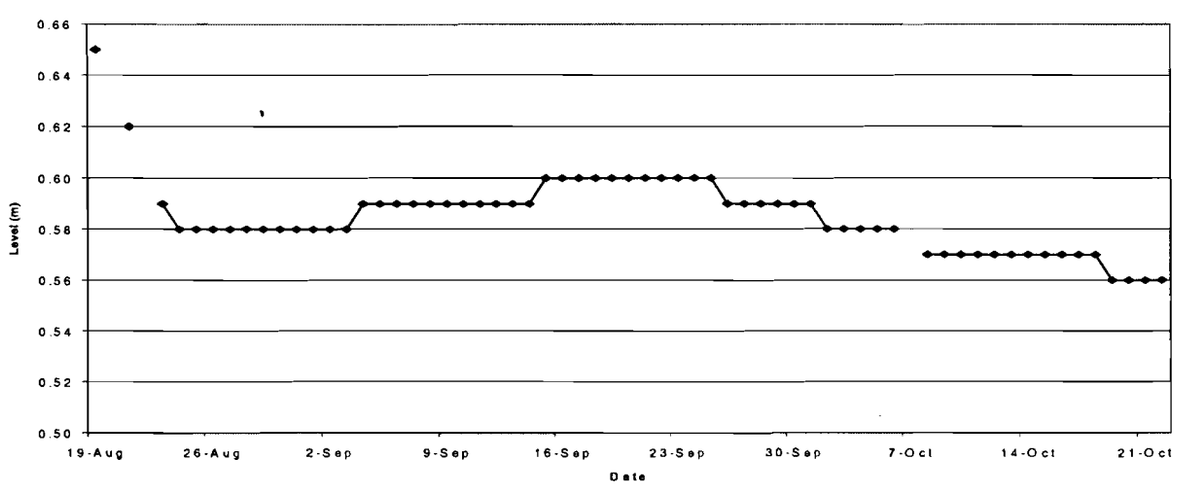

Figure 5. Daily water level readings taken at the Fishing Branch River weir, 1996.

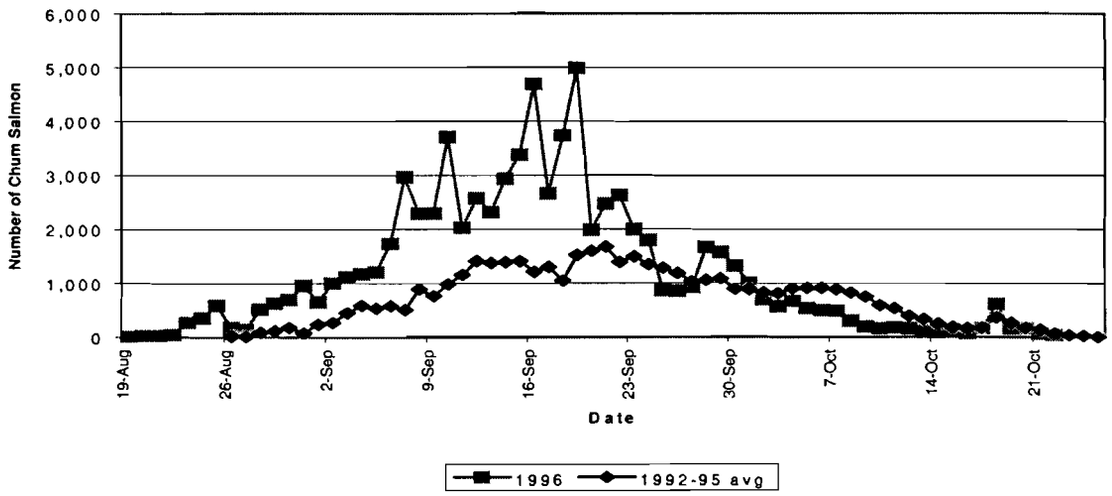

Figure 6. Daily counts of chum salmon through the Fishing Branch River weir, 1996 versus 1992 – 1995 average.

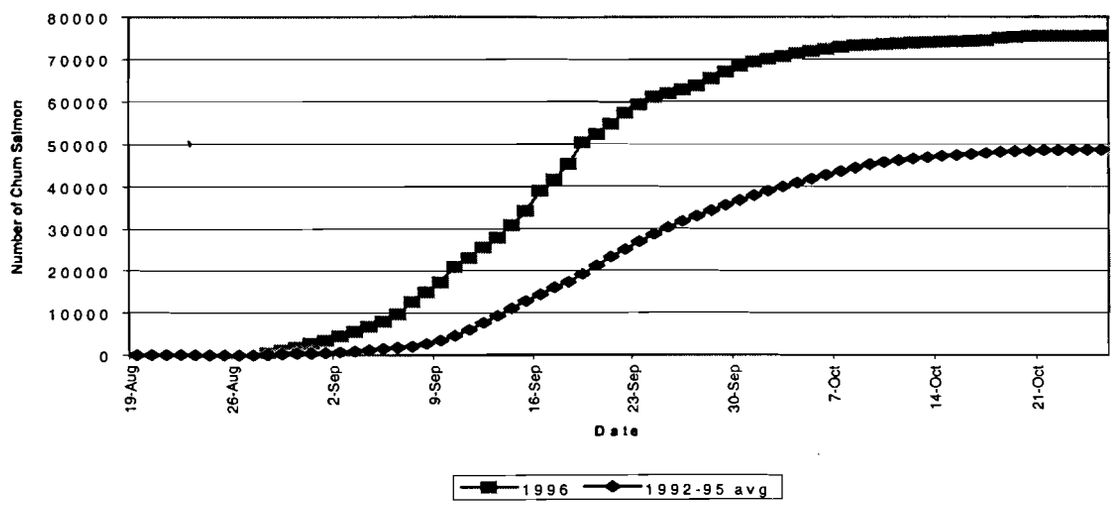

Figure 7. Cumulative counts of chum salmon through the Fishing Branch River weir, 1996 versus 1992 – 1995 average.

8.0 APPENDICES

Appendix 1. Fishing Branch River weir operations, 1996.

Date	Closure* Time	Closure* Hours	Reason
19-Aug	2400 - 1959	20	low passage rate
	2200 - 2359	2	low passage rate
20-Aug	2400 - 759	8	low passage rate
	900 - 1259	4	low passage rate
	1400 - 1659	3	low passage rate
	1800 - 2159	4	low passage rate
	2300 - 2359	1	low passage rate
21-Aug	2400 - 959	10	low passage rate
	1100 - 1459	4	low passage rate
	1600 - 1959	4	low passage rate
	2100 - 2159	1	low passage rate
	2300 - 2359	1	low passage rate
22-Aug	2400 - 859	9	low passage rate
	1000 - 1659	7	low passage rate
	1800 - 2159	4	low passage rate
	2300 - 2359	1	low passage rate
23-Aug	2400 - 759	8	low passage rate
24-Aug	-		
25-Aug	-		
26-Aug	1900 - 2059	2	pre-live sample closure**
27-Aug	2400 - 759	8	pre-live sample closure**
28-Aug	1900 - 2059	2	pre-live sample closure**
29-Aug	-		
30-Aug	1900 - 1959	1	pre-live sample closure**
31-Aug	1800 - 1859	1	pre-live sample closure**
1-Sep through 26-Sep	-		
27-Sep	400 - 559	2	lighting system problems
27-Sep	1700 - 1759	1	pre-live sample closure**
28-Sep	-		
29-Sep	-		
30-Sep	1500 - 1559	1	other duties - carcass sampling
1-Oct	-		
2-Oct	-		
3-Oct	-		
4-Oct	-		
5-Oct	-		
6-Oct	-		
7-Oct	1600 - 1659	1	other duties - carcass sampling
8-Oct	-		
9-Oct	1400 - 1459	1	other duties - carcass sampling
10-Oct	-		
11-Oct	1200 - 1559	4	pre-live sample closure**
12-Oct	-		
13-Oct	-		
14-Oct	1400 - 1559	2	other duties - carcass sampling
15-Oct through 22-Oct	-		

* The weir gate was open or live sampling was conducted during all hourly periods not listed.
** Allowed fish to congregate in chamber so that adequate numbers could be captured for live-sampling.

Appendix 2. Daily counts of chum salmon through the Fishing Branch River weir, 1996.

Date	Daily Male	Daily Female	Daily Total	Cumulative Total	Run Timing
19-Aug	5	4	9	9	0.0%
20-Aug	17	10	27	36	0.0%
21-Aug	14	15	29	65	0.1%
22-Aug	28	22	50	115	0.1%
23-Aug	157	118	275	390	0.5%
24-Aug	230	128	358	748	1.0%
25-Aug	376	217	593	1,341	1.7%
26-Aug	111	69	180	1,521	2.0%
27-Aug	87	55	142	1,663	2.2%
28-Aug	314	204	518	2,181	2.8%
29-Aug	401	229	630	2,811	3.6%
30-Aug	414	291	705	3,516	4.6%
31-Aug	573	391	964	4,480	5.8%
1-Sep	385	273	658	5,138	6.7%
2-Sep	587	418	1,005	6,143	8.0%
3-Sep	627	493	1,120	7,263	9.4%
4-Sep	717	458	1,175	8,438	10.9%
5-Sep	732	482	1,214	9,652	12.5%
6-Sep	978	756	1,734	11,386	14.7%
7-Sep	1,535	1,430	2,965	14,351	18.6%
8-Sep	1,284	1,013	2,297	16,648	21.6%
9-Sep	1,224	1,072	2,296	18,944	24.5%
10-Sep	2,058	1,648	3,706	22,650	29.3%
11-Sep	1,218	816	2,034	24,684	32.0%
12-Sep	1,352	1,222	2,574	27,258	35.3%
13-Sep	1,258	1,060	2,318	29,576	38.3%
14-Sep	1,628	1,306	2,934	32,510	42.1%
15-Sep	1,774	1,608	3,382	35,892	46.5%
16-Sep	2,256	2,435	4,691	40,583	52.6%
17-Sep	1,287	1,376	2,663	43,246	56.0%
18-Sep	1,593	2,146	3,739	46,985	60.9%
19-Sep	1,985	3,003	4,988	51,973	67.3%
20-Sep	921	1,068	1,989	53,962	69.9%
21-Sep	957	1,515	2,472	56,434	73.1%
22-Sep	955	1,675	2,630	59,064	76.5%
23-Sep	820	1,176	1,996	61,060	79.1%
24-Sep	702	1,094	1,796	62,856	81.4%
25-Sep	380	485	865	63,721	82.5%
26-Sep	343	516	859	64,580	83.7%
27-Sep	306	621	927	65,507	84.9%
28-Sep	606	1,061	1,667	67,174	87.0%
29-Sep	582	996	1,578	68,752	89.1%
30-Sep	461	870	1,331	70,083	90.8%
1-Oct	400	608	1,008	71,091	92.1%
2-Oct	321	378	699	71,790	93.0%
3-Oct	233	343	576	72,366	93.7%
4-Oct	238	432	670	73,036	94.6%
5-Oct	178	357	535	73,571	95.3%
6-Oct	148	348	496	74,067	95.9%
7-Oct	153	340	493	74,560	96.6%
8-Oct	97	202	299	74,859	97.0%
9-Oct	81	109	190	75,049	97.2%
10-Oct	77	85	162	75,211	97.4%
11-Oct	90	86	176	75,387	97.7%
12-Oct	71	95	166	75,553	97.9%
13-Oct	37	71	108	75,661	98.0%
14-Oct	35	69	104	75,765	98.1%
15-Oct	68	70	138	75,903	98.3%
16-Oct	37	34	71	75,974	98.4%
17-Oct	73	94	167	76,141	98.6%
18-Oct	212	400	612	76,753	99.4%
19-Oct	51	115	166	76,919	99.6%
20-Oct	48	118	166	77,085	99.9%
21-Oct	32	38	70	77,155	99.9%
22-Oct	13	32	45	77,200	100.0%
TOTALS	36,931	40,269	77,200		

Appendix 3.0. Hourly counts of male chum salmon through the Fishing Branch River weir, 1996.

Date/Time	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	Cum Total
19-Aug																						5			5	5
20-Aug									1					0				7					9		17	22
21-Aug											0					1					2		11		14	36
22-Aug										1								2					25		28	64
23-Aug									0	0	0	0	0	0	0	0	1	0	0	29	33	22	37	35	157	221
24-Aug	4	12	10	3	1	0	1	2	0	0	0	1	0	0	0	0	0	0	15	33	59	19	27	43	230	451
25-Aug	25	28	10	31	2	2	5	11	5	0	0	0	0	0	0	2	23	32	18	0	57	29	41	55	376	827
26-Aug	27	11	12	12	9	2	2	8	1	0	0	0	0	0	1	0	1	2	5	0	0	3	5	10	111	938
27-Aug	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	1	2	8	0	0	0	6	0	67	87	1,025
28-Aug	35	31	15	17	2	2	1	4	5	6	5	7	0	2	12	10	15	10	13	0	0	21	68	33	314	1,339
29-Aug	14	4	18	7	12	2	4	2	4	0	4	2	0	3	0	2	13	67	24	74	39	43	36	27	401	1,740
30-Aug	16	23	22	8	2	1	3	21	11	13	2	3	2	1	0	1	11	19	7	0	24	60	69	95	414	2,154
31-Aug	67	50	46	22	10	13	1	21	6	4	3	1	1	0	15	11	10	20	0	22	149	47	20	34	573	2,727
1-Sep	30	0	3	0	7	4	1	3	6	5	3	5	1	0	0	1	23	33	21	21	16	17	80	105	385	3,112
2-Sep	38	26	35	17	23	12	1	10	29	8	3	4	5	13	39	44	19	8	8	74	59	32	46	34	587	3,699
3-Sep	22	14	13	4	7	8	6	2	12	12	8	6	4	10	13	24	22	55	37	45	149	53	30	71	627	4,326
4-Sep	55	36	30	23	11	8	8	19	12	12	10	6	1	5	8	13	4	32	25	24	146	105	36	88	717	5,043
5-Sep	57	44	42	30	6	9	1	5	16	16	16	5	3	4	5	18	32	41	21	20	14	60	91	176	732	5,775
6-Sep	99	64	51	8	15	8	5	15	21	14	12	20	5	5	12	20	30	50	20	20	145	118	119	102	978	6,753
7-Sep	110	100	124	82	46	29	10	35	62	57	21	14	15	15	19	29	22	46	28	28	174	224	123	122	1,535	8,288
8-Sep	93	82	79	65	46	31	13	37	71	53	26	17	12	6	18	13	60	33	28	28	186	108	92	87	1,284	9,572
9-Sep	99	74	22	28	10	14	7	12	33	30	33	14	12	11	11	22	41	59	17	16	26	119	237	277	1,224	10,796
10-Sep	115	139	70	87	37	57	50	114	134	37	27	16	17	19	30	29	13	56	76	143	165	300	209	118	2,058	12,854
11-Sep	84	82	132	66	31	39	12	6	35	27	22	22	6	10	45	52	55	75	41	70	105	74	73	54	1,218	14,072
12-Sep	40	17	12	32	37	25	14	33	46	86	63	65	19	19	18	10	7	33	73	18	32	301	181	171	1,352	15,424
13-Sep	129	75	48	30	21	27	9	8	7	56	64	46	24	14	32	42	37	20	11	10	119	139	116	174	1,258	16,682
14-Sep	163	176	73	58	41	15	5	32	59	113	45	45	2	22	41	42	22	23	57	58	173	190	96	77	1,628	18,310
15-Sep	78	94	104	137	109	58	32	60	207	165	108	52	22	21	26	2	18	10	29	104	108	108	23	99	1,774	20,084
16-Sep	81	126	73	75	116	124	134	137	239	262	104	25	7	15	11	7	34	99	18	19	161	186	94	109	2,256	22,340
17-Sep	65	84	60	39	50	32	33	17	18	52	14	22	10	36	45	70	92	117	103	32	148	27	80	41	1,287	23,627
18-Sep	52	16	27	33	17	13	16	14	46	94	85	47	41	36	49	76	121	117	109	132	191	123	92	46	1,593	25,220
19-Sep	37	52	123	87	104	82	31	10	99	28	71	77	49	55	44	41	68	93	16	222	179	106	245	66	1,985	27,205
20-Sep	47	50	41	33	84	26	12	13	7	32	49	31	13	24	27	48	60	72	27	63	85	20	27	30	921	28,126
21-Sep	21	18	30	14	9	31	18	15	32	75	57	49	25	28	30	8	13	41	10	77	151	99	48	58	957	29,083
22-Sep	38	54	36	20	53	50	20	6	16	58	41	7	6	24	10	38	62	71	9	102	86	58	62	28	955	30,038
23-Sep	31	30	41	33	45	41	37	19	92	75	38	27	10	9	5	9	13	35	13	45	55	42	33	42	820	30,858
24-Sep	17	16	28	26	30	36	24	7	15	19	35	21	16	17	25	33	31	37	16	71	68	47	40	27	702	31,560
25-Sep	8	13	22	15	18	20	11	4	16	42	34	9	14	10	15	16	14	28	5	14	19	15	12	6	380	31,940
26-Sep	7	7	17	22	5	12	9	7	6	31	36	16	8	12	1	5	17	22	20	24	2	17	17	23	343	32,283
27-Sep	13	7	3	5	0	0	3	1	5	8	1	3	9	3	22	18	4	0	6	55	52	35	31	22	306	32,589
28-Sep	9	39	36	50	6	10	12	12	5	19	36	71	18	30	19	26	33	20	12	54	45	31	5	8	606	33,195
29-Sep	26	22	24	21	25	40	25	7	33	42	27	22	17	4	17	19	11	16	5	65	29	39	30	16	582	33,777
30-Sep	19	26	10	25	22	24	17	10	26	46	32	23	4	11	4		1	8	40	30	21	16	31	15	461	34,238
1-Oct	26	26	18	15	42	31	10	6	16	30	7	3	11	16	7	14	8	22	17	40	9	9	11	6	400	34,638
2-Oct	7	7	4	8	6	10	16	18	15	12	22	16	7	13	19	14	8	12	25	24	13	16	16	13	321	34,959
3-Oct	8	10	9	4	5	7	7	16	23	12	30	13	9	3	4	6	4	6	6	18	17	9	4	3	233	35,192
4-Oct	6	4	4	3	12	3	17	6	9	32	21	4	5	0	4	10	9	11	12	18	15	16	10	7	238	35,430
5-Oct	2	5	5	4	7	6	4	10	0	17	17	7	4	3	4	6	10	8	9	16	13	15	3	3	178	35,608
6-Oct	2	2	5	3	6	8	7	13	7	11	18	3	0	6	2	4	3	5	8	10	5	7	4	9	148	35,756
7-Oct	3	6	4	5	9	8	1	4	4	12	9	5	3	8	8	5	0	14	7	7	7	7	14	3	153	35,909
8-Oct	3	0	4	1	4	0	2	3	0	7	11	4	6	10	9	2	5	4	6	4	4	5	1	2	97	36,006
9-Oct	4	4	3	4	8	3	8	3	2	8	1	2	3	5	0	2	5	2	2	0	1	6	1	4	81	36,087
10-Oct	1	0	1	2	0	2	3	1	0	10	4	2	1	6	3	4	7	2	0	3	3	12	6	4	77	36,164
11-Oct	1	0	2	4	3	1	3	0	3	3	6	7	0	0	0	0	9	22	12	9	4	0	1	0	90	36,254
12-Oct	3	2	0	7	4	1	4	0	2	3	1	1	1	4	7	2	0	0	5	7	4	9	4	0	71	36,325
13-Oct	0	1	2	1	1	0	1	2	1	2	2	3	2	5	2	2	1	1	0	2	2	1	3	0	37	36,362
14-Oct	0	0	1	1	1	0	2	2	1	1	0	1	0	1			3	5	7	3	3	1	0	2	35	36,397
15-Oct	1	6	2	5	3	3	3	0	4	2	5	1	5	4	1	1	8	1	2	3	0	6	2	0	68	36,465
16-Oct	3	1	0	0	1	0	1	4	0	1	1	1	0	2	0	0	0	1	1	1	6	4	6	3	37	36,502
17-Oct	2	2	1	4	3	0	4	1	4	0	0	1	1	2	0	0	5	4	4	2	10	4	9	10	73	36,575
18-Oct	9	16	10	24	6	11	9	16	5	12	4	10	10	6	8	13	8	3	8	1	4	3	8	8	212	36,787
19-Oct	8	3	4	0	1	1	2	3	0	3	0	0	2	1	3	3	3	2	0	3	3	2	3	1	51	36,838
20-Oct	1	3	2	2	0	5	1	1	0	3	3	5	2	1	3	0	7	1	1	3	2	0	1	1	48	36,886
21-Oct	0	1	0	2	1	1	1	2	1	1	0	1	4	3	2	1	2	2	0	4	3	0	0	0	32	36,918
22-Oct	0	0	0	0	0	1	2	1	0	1	0	1	1	0	0	0	1	0	0	1	1	1	0	2	13	36,931

Appendix 3.1. Hourly counts of female chum salmon through the Fishing Branch River weir, 1996.

Date/Time	2400	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total	Cum Total
19-Aug																						4			4	4
20-Aug									0					1				5					4		10	14
21-Aug											0					0					4		11		15	29
22-Aug										1								3					18		22	51
23-Aug									0	0	0	0	1	0	0	0	3	0	0	22	15	11	25	41	118	169
24-Aug	3	7	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	12	32	14	13	27	128	297
25-Aug	21	24	6	20	3	1	1	1	1	0	0	0	0	0	0	2	9	16	8	0	34	12	20	38	217	514
26-Aug	13	7	12	10	8	1	1	4	0	0	0	0	0	0	0	0	1	0	3	0	0	1	1	7	69	583
27-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	4	0	3	0	5	0	39	55	638
28-Aug	21	14	8	3	3	1	1	1	7	5	6	1	0	1	4	8	8	5	15	0	0	7	56	29	204	842
29-Aug	8	2	10	1	4	1	0	0	1	2	0	2	2	0	0	4	11	35	9	31	23	23	26	34	229	1,071
30-Aug	25	25	27	7	2	1	1	11	5	1	2	0	2	0	0	0	6	20	2	0	13	28	59	54	291	1,362
31-Aug	50	38	29	17	9	12	2	9	3	4	0	1	1	1	17	6	10	26	0	22	74	29	12	19	391	1,753
1-Sep	16	1	2	1	6	4	0	0	1	3	3	2	2	1	2	1	16	22	8	8	14	14	43	103	273	2,026
2-Sep	43	24	27	26	9	7	2	2	13	4	2	1	3	5	24	28	7	4	9	44	42	19	35	38	418	2,444
3-Sep	24	12	15	6	4	1	0	2	3	1	3	1	3	4	7	9	22	45	24	57	121	47	32	50	493	2,937
4-Sep	49	27	20	17	4	3	8	7	6	2	2	2	0	3	5	12	6	30	20	21	81	53	24	56	458	3,395
5-Sep	33	33	37	16	0	4	0	1	5	9	4	6	4	4	5	7	21	23	15	15	17	42	45	136	482	3,877
6-Sep	71	47	41	3	6	3	0	8	4	2	8	6	1	9	12	20	25	48	16	16	95	95	101	119	756	4,633
7-Sep	77	77	100	102	41	23	7	14	18	27	17	10	5	10	16	25	22	39	24	24	169	276	138	169	1,430	6,063
8-Sep	130	75	66	54	33	11	6	10	30	38	12	9	5	3	14	20	38	10	16	16	160	95	93	69	1,013	7,076
9-Sep	72	39	19	30	2	3	2	7	14	19	11	4	2	5	3	20	31	49	12	11	24	175	244	274	1,072	8,148
10-Sep	130	112	59	68	22	21	31	46	75	19	15	13	14	13	19	26	10	34	52	103	143	372	170	81	1,648	9,796
11-Sep	62	53	93	31	12	12	1	4	11	14	11	12	1	11	33	31	27	55	29	46	96	92	43	36	816	10,612
12-Sep	19	10	6	12	17	9	7	11	27	38	36	30	9	9	10	7	6	42	79	22	28	369	204	215	1,222	11,834
13-Sep	130	64	27	13	11	7	3	4	7	26	41	23	3	3	16	28	21	29	14	15	132	166	139	138	1,060	12,894
14-Sep	155	123	37	37	23	12	3	11	34	68	41	34	2	14	36	24	17	14	34	44	160	188	116	79	1,306	14,200
15-Sep	55	77	56	114	91	21	23	45	129	139	77	60	31	11	39	3	23	10	41	134	184	153	19	73	1,608	15,808
16-Sep	67	140	64	74	84	123	120	132	236	294	111	23	4	14	16	11	21	110	21	22	241	273	109	125	2,435	18,243
17-Sep	69	79	81	36	28	23	10	11	12	38	14	19	10	29	47	77	89	132	127	38	260	37	84	26	1,376	19,619
18-Sep	71	14	20	29	11	3	11	5	37	93	75	32	32	42	71	110	146	193	148	228	335	252	137	51	2,146	21,765
19-Sep	54	47	171	131	143	87	27	4	118	25	61	86	76	48	54	68	100	116	44	329	327	238	545	104	3,003	24,768
20-Sep	53	57	25	25	85	25	10	2	12	22	61	29	16	16	21	63	97	111	33	100	116	26	27	36	1,068	25,836
21-Sep	18	21	18	12	19	22	19	16	24	89	65	56	41	14	22	22	32	58	20	200	383	172	79	93	1,515	27,351
22-Sep	44	63	45	31	47	54	14	4	23	65	34	15	12	21	18	53	127	149	21	246	237	141	189	22	1,675	29,026
23-Sep	37	43	40	36	42	53	15	22	140	118	65	31	5	7	14	22	19	48	17	64	163	99	41	35	1,176	30,202
24-Sep	30	18	33	33	31	45	23	9	23	18	36	21	20	17	32	34	67	84	14	125	148	141	62	30	1,094	31,296
25-Sep	13	17	22	17	17	16	5	3	19	37	47	19	15	10	11	24	38	43	15	29	31	17	15	5	485	31,781
26-Sep	9	5	24	20	12	7	8	9	15	43	30	31	17	19	1	17	30	36	53	54	1	22	31	22	516	32,297
27-Sep	15	13	5	8	0	0	0	0	4	12	0	0	7	12	22	25	9	0	14	143	106	113	68	45	621	32,918
28-Sep	19	52	37	58	9	9	14	8	29	31	43	91	22	27	19	47	63	52	8	148	132	108	14	21	1,061	33,979
29-Sep	18	20	28	38	22	41	22	21	64	48	54	34	12	8	20	29	45	62	25	134	106	76	43	26	996	34,975
30-Sep	15	37	7	42	34	28	24	7	27	62	56	38	14	12	6		8	28	90	110	124	42	38	21	870	35,845
1-Oct	38	41	34	25	28	38	15	14	27	62	16	1	12	14	8	15	19	31	23	57	44	16	18	12	608	36,453
2-Oct	2	7	2	8	7	10	6	19	11	17	21	8	8	13	14	19	10	16	32	31	46	28	26	17	378	36,831
3-Oct	16	11	6	1	6	10	5	10	31	26	37	18	9	5	10	9	4	12	14	34	28	26	8	7	343	37,174
4-Oct	4	7	3	0	17	6	19	9	16	27	32	13	0	4	4	11	18	16	40	53	57	38	16	22	432	37,606
5-Oct	4	13	5	3	5	4	16	0	3	18	29	16	11	11	7	10	9	13	11	44	52	39	27	7	357	37,963
6-Oct	4	5	4	8	11	23	15	12	8	35	53	16	4	6	10	8	12	17	24	32	10	5	16	10	348	38,311
7-Oct	12	9	9	9	16	6	6	4	5	26	20	13	5	12	7	8	0	26	20	17	48	31	26	5	340	38,651
8-Oct	4	6	1	3	10	1	3	4	0	7	14	6	11	11	18	6	9	16	16	14	14	21	4	3	202	38,853
9-Oct	3	9	4	1	3	2	2	0	1	9	6	4	9	2	0	1	5	3	9	4	5	16	8	3	109	38,962
10-Oct	0	0	3	9	0	1	4	0	1	5	3	2	3	3	2	7	0	0	11	11	2	11	4	3	85	39,047
11-Oct	4	1	2	1	0	0	3	0	0	2	4	7	0	0	0	0	11	21	9	7	8	3	3	0	86	39,133
12-Oct	2	3	8	2	2	3	5	4	0	2	1	9	1	3	2	3	3	3	11	13	1	9	3	2	95	39,228
13-Oct	1	2	4	2	1	0	0	5	2	2	7	2	4	1	9	4	4	2	3	3	3	4	2	4	71	39,299
14-Oct	2	1	1	0	0	1	2	2	4	1	1	4	3	3			6	4	9	8	7	5	4	1	69	39,368
15-Oct	2	7	4	4	1	2	1	0	1	2	4	2	1	4	3	2	5	8	4	5	1	3	4	0	70	39,438
16-Oct	3	1	2	0	1	0	0	2	0	0	0	2	0	2	0	2	1	3	2	2	3	1	4	3	34	39,472
17-Oct	1	2	1	1	2	1	3	3	1	4	3	1	0	1	4	5	6	3	4	4	6	3	18	17	94	39,566
18-Oct	28	21	13	18	9	31	14	18	5	27	16	14	18	9	21	16	14	19	23	9	25	8	13	11	400	39,966
19-Oct	15	6	2	2	3	4	1	3	2	5	4	0	3	0	4	3	4	10	3	9	13	7	10	2	115	40,081
20-Oct	3	0	3	7	1	4	4	4	1	6	10	14	1	9	6	5	7	5	6	6	5	9	2	0	118	40,199
21-Oct	1	1	0	3	2	4	0	1	1	2	4	5	3	1	1	1	1	0	1	1	4	0	1	0	38	40,237
22-Oct	1	0	0	0	1	1	3	0	2	5	1	4	1	3	2	1	0	1	0	2	1	2	0	1	32	40,269

Appendix 3.2. Diel run timing of male and female chum salmon through the Fishing Branch River weir, 1996.

Date/Time	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Sum	# Fish
22-Oct	2%	0%	0%	0%	2%	4%	11%	2%	4%	13%	2%	11%	4%	7%	4%	2%	2%	2%	0%	7%	4%	7%	0%	7%	100%	45
21-Oct	1%	3%	0%	7%	4%	7%	1%	4%	3%	4%	6%	9%	10%	6%	4%	3%	4%	3%	1%	7%	10%	0%	1%	0%	100%	70
16-Oct	8%	3%	3%	0%	3%	0%	1%	8%	0%	1%	1%	4%	0%	6%	0%	3%	1%	6%	4%	4%	13%	7%	14%	8%	100%	71
13-Oct	1%	3%	6%	3%	2%	0%	1%	6%	3%	4%	8%	5%	6%	6%	10%	6%	5%	3%	3%	5%	5%	5%	5%	4%	100%	108
15-Oct	2%	9%	4%	7%	3%	4%	3%	0%	4%	3%	7%	2%	4%	6%	3%	2%	9%	7%	4%	6%	1%	7%	4%	0%	100%	138
10-Oct	1%	0%	2%	7%	0%	2%	4%	1%	1%	9%	4%	2%	2%	6%	3%	7%	4%	1%	7%	9%	3%	14%	6%	4%	100%	162
12-Oct	3%	3%	5%	5%	4%	2%	5%	2%	1%	3%	1%	6%	1%	4%	5%	3%	2%	2%	10%	12%	3%	11%	4%	1%	100%	166
19-Oct	14%	5%	4%	1%	2%	3%	2%	4%	1%	5%	2%	0%	3%	1%	4%	4%	4%	7%	2%	7%	10%	5%	8%	2%	100%	166
20-Oct	2%	2%	3%	5%	1%	5%	3%	3%	1%	5%	8%	11%	2%	6%	5%	3%	8%	4%	4%	5%	4%	5%	2%	1%	100%	166
17-Oct	2%	2%	1%	3%	3%	1%	4%	2%	3%	2%	2%	1%	1%	2%	2%	3%	7%	4%	5%	4%	10%	4%	16%	16%	100%	167
9-Oct	4%	7%	4%	3%	6%	3%	5%	2%	2%	9%	4%	3%	6%	4%	0%	2%	5%	3%	6%	2%	3%	12%	5%	4%	100%	190
8-Oct	2%	2%	2%	1%	5%	0%	2%	2%	0%	5%	8%	3%	6%	7%	9%	3%	5%	7%	7%	6%	6%	9%	2%	2%	100%	299
24-Aug	2%	5%	5%	2%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	13%	25%	9%	11%	20%	100%	358
7-Oct	3%	3%	3%	3%	5%	3%	1%	2%	2%	8%	6%	4%	2%	4%	3%	3%	0%	8%	5%	5%	11%	8%	8%	2%	100%	493
6-Oct	1%	1%	2%	2%	3%	6%	4%	5%	3%	9%	14%	4%	1%	2%	2%	2%	3%	4%	6%	8%	3%	2%	4%	4%	100%	496
5-Oct	1%	3%	2%	1%	2%	2%	4%	2%	1%	7%	9%	4%	3%	3%	2%	3%	4%	4%	4%	11%	12%	10%	6%	2%	100%	535
3-Oct	4%	4%	3%	1%	2%	3%	2%	5%	9%	7%	12%	5%	3%	1%	2%	3%	1%	3%	3%	9%	8%	6%	2%	2%	100%	576
25-Aug	8%	9%	3%	9%	1%	1%	1%	2%	1%	0%	0%	0%	0%	0%	0%	1%	5%	8%	4%	0%	15%	7%	10%	16%	100%	593
18-Oct	6%	6%	4%	7%	2%	7%	4%	6%	2%	6%	3%	4%	5%	2%	5%	5%	4%	4%	5%	2%	5%	2%	3%	3%	100%	612
29-Aug	3%	1%	4%	1%	3%	0%	1%	0%	1%	0%	1%	1%	0%	0%	0%	1%	4%	16%	5%	17%	10%	10%	10%	10%	100%	630
1-Sep	7%	0%	1%	0%	2%	1%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	6%	8%	4%	4%	5%	5%	19%	32%	100%	658
4-Oct	1%	2%	1%	0%	4%	1%	5%	2%	4%	9%	8%	3%	1%	1%	1%	3%	4%	4%	8%	11%	11%	8%	4%	4%	100%	670
2-Oct	1%	2%	1%	2%	2%	3%	3%	5%	4%	4%	6%	3%	2%	4%	5%	5%	3%	4%	8%	8%	8%	6%	6%	4%	100%	699
30-Aug	6%	7%	7%	2%	1%	0%	1%	5%	2%	2%	1%	0%	1%	0%	0%	0%	2%	6%	1%	0%	5%	12%	18%	21%	100%	705
26-Sep	2%	1%	5%	5%	2%	2%	2%	2%	2%	9%	8%	5%	3%	4%	0%	3%	5%	7%	8%	9%	0%	5%	6%	5%	100%	859
25-Sep	2%	3%	5%	4%	4%	4%	2%	1%	4%	9%	9%	3%	3%	2%	3%	5%	6%	8%	2%	5%	6%	4%	3%	1%	100%	865
31-Aug	12%	9%	8%	4%	2%	3%	0%	3%	1%	1%	0%	0%	0%	0%	3%	2%	2%	5%	0%	5%	23%	8%	3%	5%	100%	964
2-Sep	8%	5%	6%	4%	3%	2%	0%	1%	4%	1%	0%	0%	1%	2%	6%	7%	3%	1%	2%	12%	10%	5%	8%	7%	100%	1,005
1-Oct	6%	7%	5%	4%	7%	7%	2%	2%	4%	9%	2%	0%	2%	3%	1%	3%	3%	5%	4%	10%	5%	2%	3%	2%	100%	1,008
3-Sep	4%	2%	3%	1%	1%	1%	1%	0%	1%	1%	1%	1%	1%	1%	2%	3%	4%	9%	5%	9%	24%	9%	6%	11%	100%	1,120
4-Sep	9%	5%	4%	3%	1%	1%	1%	2%	2%	1%	1%	1%	0%	1%	1%	2%	1%	5%	4%	4%	19%	13%	5%	12%	100%	1,175
5-Sep	7%	6%	7%	4%	0%	1%	0%	0%	2%	2%	2%	1%	1%	1%	1%	2%	4%	5%	3%	3%	3%	8%	11%	26%	100%	1,214
30-Sep	3%	5%	1%	5%	4%	4%	3%	1%	4%	8%	7%	5%	1%	2%	1%	0%	1%	3%	10%	11%	11%	4%	5%	3%	100%	1,331
29-Sep	3%	3%	3%	4%	3%	5%	3%	2%	6%	6%	5%	4%	2%	1%	2%	3%	4%	5%	2%	13%	9%	7%	5%	3%	100%	1,578
28-Sep	2%	5%	4%	6%	1%	1%	2%	1%	2%	3%	5%	10%	2%	3%	2%	4%	6%	4%	1%	12%	11%	8%	1%	2%	100%	1,667
6-Sep	10%	6%	5%	1%	1%	1%	0%	1%	1%	1%	1%	1%	0%	1%	1%	2%	3%	6%	2%	2%	14%	12%	13%	13%	100%	1,734
24-Sep	3%	2%	3%	3%	3%	5%	3%	1%	2%	2%	4%	2%	2%	2%	3%	4%	5%	7%	2%	11%	12%	10%	6%	3%	100%	1,796
20-Sep	5%	5%	3%	3%	8%	3%	1%	1%	1%	3%	6%	3%	1%	2%	2%	6%	8%	9%	3%	8%	10%	2%	3%	3%	100%	1,989
23-Sep	3%	4%	4%	3%	4%	5%	3%	2%	12%	10%	5%	3%	1%	1%	1%	2%	2%	4%	2%	5%	11%	7%	4%	4%	100%	1,996
11-Sep	7%	7%	11%	5%	2%	3%	1%	0%	2%	2%	2%	2%	0%	1%	4%	4%	4%	6%	3%	6%	10%	8%	6%	4%	100%	2,034
9-Sep	7%	5%	2%	3%	1%	1%	0%	1%	2%	2%	2%	1%	1%	1%	1%	2%	3%	5%	1%	1%	2%	13%	21%	24%	100%	2,296
8-Sep	10%	7%	6%	5%	3%	2%	1%	2%	4%	4%	2%	1%	1%	0%	1%	1%	4%	2%	2%	2%	15%	9%	8%	7%	100%	2,297
13-Sep	11%	6%	3%	2%	1%	1%	1%	1%	1%	4%	5%	3%	1%	1%	2%	3%	3%	2%	1%	1%	11%	13%	11%	13%	100%	2,318
21-Sep	2%	2%	2%	1%	1%	2%	1%	1%	2%	7%	5%	4%	3%	2%	2%	1%	2%	4%	1%	11%	22%	11%	5%	6%	100%	2,472
12-Sep	2%	1%	1%	2%	2%	1%	1%	2%	3%	5%	4%	4%	1%	1%	1%	1%	1%	3%	6%	2%	2%	26%	15%	15%	100%	2,574
22-Sep	3%	4%	3%	2%	4%	4%	1%	0%	1%	5%	3%	1%	1%	2%	1%	3%	7%	8%	1%	13%	12%	8%	10%	2%	100%	2,630
17-Sep	5%	6%	5%	3%	3%	2%	2%	1%	1%	3%	1%	2%	1%	2%	3%	6%	7%	9%	9%	3%	15%	2%	6%	3%	100%	2,663
14-Sep	11%	10%	4%	3%	2%	1%	0%	1%	3%	6%	3%	3%	0%	1%	3%	2%	1%	1%	3%	3%	11%	13%	7%	5%	100%	2,934
7-Sep	6%	6%	8%	6%	3%	2%	1%	2%	3%	3%	1%	1%	1%	1%	1%	2%	1%	3%	2%	2%	12%	17%	9%	10%	100%	2,965
15-Sep	4%	5%	5%	7%	6%	2%	2%	3%	10%	9%	5%	3%	2%	1%	2%	0%	1%	1%	2%	7%	9%	8%	1%	5%	100%	3,382
10-Sep	7%	7%	3%	4%	2%	2%	2%	4%	6%	2%	1%	1%	1%	1%	1%	1%	1%	2%	3%	7%	8%	18%	10%	5%	100%	3,706
18-Sep	3%	1%	1%	2%	1%	0%	1%	1%	2%	5%	4%	2%	2%	2%	3%	5%	7%	8%	7%	10%	14%	10%	6%	3%	100%	3,739
16-Sep	3%	6%	3%	3%	4%	5%	5%	6%	10%	12%	5%	1%	0%	1%	1%	0%	1%	4%	1%	1%	9%	10%	4%	5%	100%	4,691
19-Sep	2%	2%	6%	4%	5%	3%	1%	0%	4%	1%	3%	3%	3%	2%	2%	2%	3%	4%	1%	11%	10%	7%	16%	3%	100%	4,988
Average (a)	5%	5%	4%	3%	3%	2%	2%	2%	3%	4%	4%	2%	1%	1%	2%	3%	3%	5%	4%	7%	10%	9%	8%	8%		
st. dev. (a)	3%	2%	2%	2%	2%	2%	1%	2%	3%	3%	3%	2%	1%	1%	1%	2%	2%	3%	3%	4%	5%	5%	5%	7%		
st. dev. (b)	3%	3%	2%	2%	2%	2%	3%	2%	1%	4%	4%	4%	3%	2%	3%	2%	3%	2%	3%	3%	6%	4%	5%	6%		

Days on which passage of fish was completely halted for more than one hour are not included.
(a) only days on which more than 500 fish were counted are included.
(b) only days on which fewer than 500 fish were counted are included.

Appendix 4. Daily counts of chinook and coho salmon through the Fishing Branch River weir, 1996.

	Chinook				Coho			
Date	Male	Female	Unknown	Total	Male	Female	Unknown	Total
19-Aug				0				0
20-Aug			1	1				0
21-Aug				0				0
22-Aug				0				0
23-Aug				0				0
24-Aug				0				0
25-Aug				0				0
26-Aug				0				0
27-Aug				0				0
28-Aug				0				0
29-Aug				0				0
30-Aug				0				0
31-Aug				0				0
1-Sep				0				0
2-Sep				0				0
3-Sep				0				0
4-Sep				0				0
5-Sep				0				0
6-Sep				0				0
7-Sep				0				0
8-Sep			1	1				0
9-Sep				0				0
10-Sep				0				0
11-Sep				0				0
12-Sep				0				0
13-Sep				0				0
14-Sep				0				0
15-Sep				0				0
16-Sep				0				0
17-Sep				0				0
18-Sep			1	1				0
19-Sep				0				0
20-Sep				0				0
21-Sep				0				0
22-Sep				0				0
23-Sep			1	1				0
24-Sep				0				0
25-Sep				0				0
26-Sep				0				0
27-Sep				0				0
28-Sep				0				0
29-Sep				0				0
30-Sep				0				0
1-Oct				0				0
2-Oct				0				0
3-Oct				0				0
4-Oct				0				0
5-Oct				0				0
6-Oct				0				0
7-Oct				0				0
8-Oct				0			1	1
9-Oct				0				0
10-Oct				0				0
11-Oct				0				0
12-Oct				0				0
13-Oct				0				0
14-Oct				0				0
15-Oct				0				0
16-Oct				0				0
17-Oct				0		1	2	3
18-Oct				0			3	3
19-Oct				0			1	1
20-Oct				0			3	3
21-Oct				0			1	1
22-Oct				0				0
TOTALS	0	0	4	4	0	1	11	12

19-Oct 1 female post-spawn chinook (drifted onto weir)

Appendix 5. Spaghetti tag data from the Fishing Branch River weir, 1996.

Tags Observed: (includes tags recovered)

Date	White	Yellow
5-Sep	1	
7-Sep	1	
9-Sep		3
10-Sep		1
11-Sep		3
13-Sep		1
14-Sep		2
15-Sep	1	1
16-Sep		2
18-Sep	1	1
19-Sep	1	2
20-Sep	1	5
21-Sep	1	
22-Sep	4	1
23-Sep	2	3
24-Sep	1	1
25-Sep	1	2
26-Sep		1
28-Sep	1	2
29-Sep	2	
30-Sep		2
1-Oct	1	1
2-Oct	1	1
3-Oct		2
4-Oct	1	
6-Oct		1
11-Oct		2
18-Oct	1	
19-Oct	1	
Total	23	40

Tags Recovered:

TagID	Sex	Date Tagged	Date Recovered	Days Elapsed	Rate of Travel (a,b)
1282	M	12-Aug-96			
2015	M	16-Aug-96	18-Sep-96	33.0	42.4
2051	M	16-Aug-96	15-Sep-96	30.0	46.6
2433	M	19-Aug-96	6-Sep-96	18.0	77.7
3525	F	24-Aug-96			
12004	F	12-Aug-96	11-Sep-96	30.0	46.6

(a) kilometres per day.
(b) assumes that each fish resumed its migration immediately after tag application and was captured immediately upon arrival at the weir.

Appendix 6. Age composition of Fishing Branch River chum salmon by statistical week, 1996.

Males									
Stat Week	Week Ending		Age Class 31	41	51	61	71	Weekly Sample	Weekly Count
34	24-Aug	N	0	0	7	2	0	9	451
			0%	0%	78%	22%	0%		
		Expanded #	0	0	351	100	0		
			0%	0%	78%	22%	0%		
35	31-Aug	N	0	7	15	1	0	23	2,276
			0%	30%	65%	4%	0%		
		Expanded #	0	693	1,484	99	0		
			0%	30%	65%	4%	0%		
36	7-Sep	N	0	24	26	1	0	51	5,561
			0%	47%	51%	2%	0%		
		Expanded #	0	2,617	2,835	109	0		
			0%	47%	51%	2%	0%		
37	14-Sep	N	0	59	27	1	1	88	10,022
			0%	67%	31%	1%	1%		
		Expanded #	0	6,719	3,075	114	114		
			0%	67%	31%	1%	1%		
38	21-Sep	N	0	64	18	4	0	86	10,773
			0%	74%	21%	5%	0%		
		Expanded #	0	8,017	2,255	501	0		
			0%	74%	21%	5%	0%		
39	28-Sep	N	0	34	5	0	0	39	4,112
			0%	87%	13%	0%	0%		
		Expanded #	0	3,585	527	0	0		
			0%	87%	13%	0%	0%		
40	5-Oct	N	0	17	1	0	0	18	2,413
			0%	94%	6%	0%	0%		
		Expanded #	0	2,279	134	0	0		
			0%	94%	6%	0%	0%		
41	12-Oct	N	0	4	4	0	0	8	717
			0%	50%	50%	0%	0%		
		Expanded #	0	359	359	0	0		
			0%	50%	50%	0%	0%		
42-43	26-Oct	N	0	8	1	0	0	9	606
			0%	89%	11%	0%	0%		
		Expanded #	0	539	67	0	0		
			0%	89%	11%	0%	0%		
Total		**Expanded #**	**0**	**24,807**	**11,087**	**923**	**114**	**36,931**	
			0.0%	67.2%	30.0%	2.5%	0.3%	100%	

Appendix 6 (cont'd)

Females									
Stat Week	Week Ending		Age Class 31	41	51	61	71	Weekly Sample	Weekly Count
34	24-Aug	N	0	0	0	1	0	1	297
			0%	0%	0%	100%	0%		
		Expanded #	0	0	0	297	0		
			0%	0%	0%	100%	0%		
35	31-Aug	N	0	4	8	0	0	12	1,456
			0%	33%	67%	0%	0%		
		Expanded #	0	485	971	0	0		
			0%	33%	67%	0%	0%		
36	7-Sep	N	0	21	17	2	0	40	4,310
			0%	53%	43%	5%	0%		
		Expanded #	0	2,263	1,832	216	0		
			0%	53%	43%	5%	0%		
37	14-Sep	N	0	45	25	3	0	73	8,137
			0%	62%	34%	4%	0%		
		Expanded #	0	5,016	2,787	334	0		
			0%	62%	34%	4%	0%		
38	21-Sep	N	1	85	26	2	0	114	13,151
			1%	75%	23%	2%	0%		
		Expanded #	115	9,806	2,999	231	0		
			1%	75%	23%	2%	0%		
39	28-Sep	N	1	57	9	1	0	68	6,628
			1%	84%	13%	1%	0%		
		Expanded #	97	5,556	877	97	0		
			1%	84%	13%	1%	0%		
40	5-Oct	N	0	25	9	0	0	34	3,984
			0%	74%	26%	0%	0%		
		Expanded #	0	2,929	1,055	0	0		
			0%	74%	26%	0%	0%		
41	12-Oct	N	0	5	2	0	0	7	1,265
			0%	71%	29%	0%	0%		
		Expanded #	0	904	361	0	0		
			0%	71%	29%	0%	0%		
42-43	26-Oct	N	0	6	4	0	0	10	1,041
			0%	60%	40%	0%	0%		
		Expanded #	0	625	416	0	0		
			0%	60%	40%	0%	0%		
Total		**Expanded #**	**213**	**27,583**	**11,298**	**1,175**	0	**40,269**	
			0.5%	68.5%	28.1%	2.9%	0.0%	100%	

Appendix 6 (cont'd)

Sexes Combined									
Stat Week	Week Ending		Age Class 31	41	51	61	71	Weekly Sample	Weekly Count
34	24-Aug	N	0	0	7	3	0	10	748
			0%	0%	70%	30%	0%		
		Expanded #	0	0	524	224	0		
			0%	0%	70%	30%	0%		
35	31-Aug	N	0	11	23	1	0	35	3,732
			0%	31%	66%	3%	0%		
		Expanded #	0	1,173	2,452	107	0		
			0%	31%	66%	3%	0%		
36	7-Sep	N	0	45	43	3	0	91	9,871
			0%	49%	47%	3%	0%		
		Expanded #	0	4,881	4,664	325	0		
			0%	49%	47%	3%	0%		
37	14-Sep	N	0	104	52	4	1	161	18,159
			0%	65%	32%	2%	1%		
		Expanded #	0	11,730	5,865	451	113		
			0%	65%	32%	2%	1%		
38	21-Sep	N	1	149	44	6	0	200	23,924
			1%	75%	22%	3%	0%		
		Expanded #	120	17,823	5,263	718	0		
			1%	75%	22%	3%	0%		
39	28-Sep	N	1	91	14	1	0	107	10,740
			1%	85%	13%	1%	0%		
		Expanded #	100	9,134	1,405	100	0		
			1%	85%	13%	1%	0%		
40	5-Oct	N	0	42	10	0	0	52	6,397
			0%	81%	19%	0%	0%		
		Expanded #	0	5,167	1,230	0	0		
			0%	81%	19%	0%	0%		
41	12-Oct	N	0	9	6	0	0	15	1,982
			0%	60%	40%	0%	0%		
		Expanded #	0	1,189	793	0	0		
			0%	60%	40%	0%	0%		
42-43	26-Oct	N	0	14	5	0	0	19	1,647
			0%	74%	26%	0%	0%		
		Expanded #	0	1,214	433	0	0		
			0%	74%	26%	0%	0%		
Total		**Expanded #**	**220**	**52,311**	**22,630**	**1,926**	**113**	**77,200**	
			0.3%	67.8%	29.3%	2.5%	0.1%	100%	

Appendix 7. Fishing Branch River weir carcass sample, 1996.

Table 1. Sex composition of chum salmon carcasses recovered at the Fishing Branch River weir, 1996.

Stat Week	Week Ending	Male	Female	Total	% Female
39	28-Sep	12	8	20	40.0%
40	5-Oct	22	8	30	26.7%
41	12-Oct	24	26	50	52.0%
42	19-Oct	16	34	50	68.0%
Total		74	76	150	50.7%

Table 2. Length composition by sex and age of chum salmon in the carcass sample, Fishing Branch River weir, 1996.

Age	41		51		61		Combined	
Sex	Female	Male	Female	Male	Female	Male	Female	Male
N	43	44	24	23	1	1	76	74
Fork Length								
Ave	614	673	635	688	640	665	620	677
Max	670	760	690	770	640	665	690	770
Min	525	575	550	605	640	665	525	575
Var	1155	1605	959	1909			1110	1599
Stdev	34	40	31	44			33	40
Post-Orbital Hypural (POH) Length								
Ave	507	529	523	545	525	515	512	533
Max	550	630	590	605	525	515	590	630
Min	470	450	445	490	525	515	445	450
Var	369	1141	943	993			592	1056
Stdev	19	34	31	32			24	32

Table 3. Age composition by age and sex in the chum salmon carcass sample, Fishing Branch River weir, 1996.

Females						Males						Total
41		51		61		41		51		61		
N	%	N	%	N	%	N	%	N	%	N	%	N
43	31.6%	24	17.6%	1	0.7%	44	32.4%	23	16.9%	1	0.7%	136

Appendix 8. Water temperature at Fishing Branch River weir, 1996 units = degrees Celsius

Date/Time	2400	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
19-Aug																					5.5	5.5		
20-Aug									4.0					4.0				4.5					4.5	
21-Aug											4.5					4.5					4.0			
22-Aug										4.0								4.0					4.0	
23-Aug									4.0		4.0		4.5				5.0				5.0	5.0		5.0
24-Aug	5.0				4.0				3.5				5.0				7.0				7.0			7.0
25-Aug	6.5				5.5				5.0				6.0				7.0				7.0			
26-Aug	6.0				5.5				5.0				5.5				5.5				5.0			
27-Aug									4.0				4.5				5.0				5.0			
28-Aug	5.0				4.5				4.0				4.5				4.5				5.0			
29-Aug	5.0				4.5				4.5				4.5				5.0				6.0			
30-Aug	6.0				5.5				5.5				5.5				5.5				5.5			
31-Aug	6.0				5.5				5.5				5.5				7.0				7.5			
1-Sep	6.0				4.5				3.5				4.5				5.0				5.5			
2-Sep	6.0				5.5				5.0				5.0				6.0				7.0			
3-Sep	5.0				4.5				4.5				5.0				6.0				5.5			
4-Sep	5.5				5.0				4.5				4.5				5.5				6.5			
5-Sep	4.5				4.0				4.0				4.5				5.0				5.5			
6-Sep	5.5				4.0				4.0				4.0				5.5				6.0			
7-Sep	4.5				4.0				4.0				4.5				4.5				6.0			
8-Sep	5.0				4.5				4.5				4.5				4.5				5.0			
9-Sep	4.5				4.5				4.5				4.5				5.0				6.0			
10-Sep	5.0				5.0				4.5				5.0				5.5				5.5			
11-Sep	5.0				5.0				4.0				4.5				5.0				5.0			
12-Sep	4.5				4.5				4.5				4.5				5.0				5.0			
13-Sep	4.5				4.5				4.0				4.5				4.5				4.5			
14-Sep	4.5				4.5				4.0				4.0				4.5				4.5			
15-Sep	4.5				4.0				4.0				4.0				4.0				4.0			
16-Sep	4.5				4.5				4.0				4.5				5.5				5.0			
17-Sep	4.0				4.0				4.0				3.5				4.5				4.0			
18-Sep	4.0				4.0				4.0				4.0				4.5				4.5			
19-Sep	5.0				4.5				4.5				4.5				5.0				5.0			
20-Sep	5.0				4.5				4.5				5.0				4.5				4.5			
21-Sep	4.0				4.5				4.5								5.0				4.5			
22-Sep	4.0				4.0				4.0				4.0				5.0				4.5			
23-Sep	4.5				4.0				4.0				4.0				4.5				4.5			
24-Sep	4.0				3.5				3.5				4.0				4.5				4.0			
25-Sep	4.0				3.0				3.5				3.0				2.5				2.5			
26-Sep	3.0				3.0				3.0				3.5				4.0				3.0			
27-Sep	3.0						2.5		2.5				2.5				3.5				3.0			
28-Sep	3.0				3.0				3.0				3.5				3.5				3.5			
29-Sep	3.5				3.5				3.0				3.5				4.0				4.0			
30-Sep	3.5				3.0				3.5				3.5				3.5				4.0			
1-Oct	3.5				3.5				3.0				3.0				3.0				3.5			
2-Oct	3.0				3.0				3.0				3.0				3.0				3.0			
3-Oct	2.5				2.5				2.0				2.5				3.0				3.0			
4-Oct	2.5				2.5				2.0				2.0				2.5				2.5			
5-Oct	2.0				2.0				1.5				1.5				2.5				2.5			
6-Oct	3.0				3.0				3.0				3.5				4.0				4.0			
7-Oct	3.0				2.5				2.5				2.0				2.0							
8-Oct	2.0				2.0				2.0				2.0				2.0				2.0			
9-Oct	3.0				2.5				2.5				3.0				3.0				3.0			
10-Oct	3.0				3.0				3.0				3.0				3.0				3.0			
11-Oct	2.0				1.5				1.5								2.0				2.5			
12-Oct	2.0				2.0				2.0				2.0				2.0				2.5			
13-Oct	2.5				2.0				2.0				2.0				2.5				2.5			
14-Oct	2.5				2.5				2.0				2.5				2.5				2.0			
15-Oct	2.0				2.0				2.5				2.5				3.0				2.5			
16-Oct	2.5				2.0				2.0				2.0				2.5				2.5			
17-Oct	2.5				2.0				2.5				2.5				2.5				2.5			
18-Oct	2.5				2.0				2.0				2.0				2.0				2.0			
19-Oct	2.0				2.0				2.0				2.0				2.0				2.0			
20-Oct	2.0				2.0				1.5				2.0				2.0				2.0			
21-Oct	2.0				2.0				1.5				1.5				1.5				1.0			
22-Oct	1.0				1.0				0.5				1.0				1.0				1.0			

Appendix 9. Water level at Fishing Branch River weir, 1996. units = metres

Date/Time	2400	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
19-Aug																					0.65	0.65		
20-Aug									0.64					0.64				0.64					0.64	
21-Aug											0.62					0.62					0.62			
22-Aug										0.61								0.61					0.60	
23-Aug									0.60		0.59		0.59				0.59				0.59	0.59		0.59
24-Aug	0.59				0.59				0.58				0.58				0.58				0.58			0.58
25-Aug	0.58				0.58				0.58				0.58				0.58				0.58			
26-Aug	0.58				0.58				0.58				0.58				0.58				0.58			
27-Aug									0.58				0.58				0.58				0.58			
28-Aug	0.58				0.58				0.58				0.58				0.58				0.58			
29-Aug	0.58				0.58				0.58				0.58				0.58				0.58			
30-Aug	0.58				0.58				0.58				0.58				0.58				0.58			
31-Aug	0.59				0.59				0.59				0.59				0.59				0.58			
1-Sep	0.58				0.58				0.58				0.58				0.58				0.58			
2-Sep	0.58				0.58				0.58				0.58				0.58				0.58			
3-Sep	0.58				0.58				0.58				0.58				0.58				0.58			
4-Sep	0.58				0.58				0.58				0.58				0.59				0.59			
5-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
6-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
7-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
8-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
9-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
10-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
11-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
12-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
13-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
14-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
15-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
16-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
17-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
18-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
19-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
20-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
21-Sep	0.60				0.60				0.60								0.60				0.60			
22-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
23-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
24-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
25-Sep	0.60				0.60				0.60				0.60				0.60				0.60			
26-Sep	0.60				0.60				0.60				0.60				0.60				0.59			
27-Sep	0.59						0.59		0.59				0.59				0.59				0.59			
28-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
29-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
30-Sep	0.59				0.59				0.59				0.59				0.59				0.59			
1-Oct	0.59				0.59				0.59				0.59				0.59				0.59			
2-Oct	0.59				0.59				0.59				0.58				0.58				0.58			
3-Oct	0.58				0.58				0.58				0.58				0.58				0.58			
4-Oct	0.58				0.58				0.58				0.58				0.58				0.58			
5-Oct	0.58				0.58				0.58				0.58				0.58				0.58			
6-Oct	0.58				0.58				0.58				0.58				0.58				0.58			
7-Oct	0.58				0.58				0.58				0.58				0.58							
8-Oct	0.58				0.57				0.57				0.57				0.57				0.57			
9-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
10-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
11-Oct	0.57				0.57				0.57								0.57				0.57			
12-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
13-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
14-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
15-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
16-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
17-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
18-Oct	0.57				0.57				0.57				0.57				0.57				0.57			
19-Oct	0.57				0.57				0.56				0.56				0.56				0.56			
20-Oct	0.56				0.56				0.56				0.56				0.56				0.56			
21-Oct	0.56				0.56				0.56				0.56				0.56				0.56			
22-Oct	0.56				0.56				0.56				0.56				0.56				0.56			

Appendix 10. Annual counts of Fishing Branch River salmon, 1971 – 1996.

Year	Chum [a,b]	Chinook [h]	Coho [h]
1971	312,800	0 [b]	6 [b]
1972	35,125 [c]	1	0
1973	15,989 [d]	3	6
1974	32,525 [d]	2	0
1975	353,282 [d]	3	0
1976	36,584		
1977	88,400		
1978	40,800		
1979	119,898		
1980	55,268		
1981	57,386 [e]		
1982	15,901		
1983	27,200		
1984	15,150		
1985	56,016 [d]	3	0
1986	31,723 [d]	4	0
1987	48,956 [d]	0	6
1988	23,597 [d]	3	0
1989	43,834 [d]	6	12
1990	35,000 [f]		
1991	37,733 [d]	6	23
1992	22,517 [d]	1	0
1993	28,707 [d]	2	0
1994	65,247 [d]	23	100
1995	51,971 [d,g]	7	112
1996	77,200 [d]	4	12

[a] Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.
[b] Aerial survey count unless otherwise indicated.
[c] Weir installed on September 22. Estimate consists of a weir count of 17,190 after September 22, and a tagging passage estimate of 17,935 prior to weir installation.
[d] Weir count.
[e] Initial aerial survey count was doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.
[f] Weir was not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000-40,000 fish considering aerial survey timing.
[g] Incomplete count due to late installation and/or early removal of project or high water events.
[h] Weir counts unless otherwise indicated.